Annual Tuberculosis Surveillance Report Colorado 2013

Colorado Department of Public Health and Environment

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Summary

The state of Colorado documented 74 new cases of active tuberculosis (TB) disease during the 2013 calendar year. This represents a 15.6% increase from the 64 cases reported in 2012. The largest changes demographically, were among the White/Caucasian population (from 5 cases in 2012 to 10 in 2013; a 100% increase), and the Black/African-American population (from 9 cases in 2012 to 19 in 2013, a 111% increase). The Hispanic demographic group experienced comparable numbers over the last two years (from 29 cases in 2012 down slightly to 24 in 2013.) Birth in one of the 22 countries with highest TB burden (accounting for 80% of all cases of active TB disease worldwide) remains the strongest risk factor for developing active TB disease (29.7% of all 2013 cases) followed by diabetes (16.2%) and excessive alcohol use within the last year (9.5%). See **Table 1** for a more detailed demographic analysis.

Sixteen of the state's 64 counties reported at least one new case of active TB disease in 2013. Denver reported the most cases (21) of any single Colorado county. Tri-County Health Department which serves the citizens of Adams, Arapahoe, and Douglas Counties saw 23 new cases of TB in 2013 and El Paso County saw eight. Forty-five of Colorado's 64 counties have reported at least one case of active TB in the past ten years (2004-2013)—see **Table 3**.

The overall incidence rate for active TB disease in Colorado in 2013 increased to 1.4 per 100,000 persons from 1.2 in 2012; as compared to the national rate in the United States of 3.2 per 100,000 according to the March 2013 TB report from the US Centers for Disease Control and Prevention (CDC). In 2013, the TB incidence rate in the foreign-born population living in Colorado was 11.3 per 100,000 persons, which is 37 times higher than that of the U.S.-born population (0.3 per 100,000). This is a significant increase from past two years. Since 2004, more than two-thirds (648 of 930 cases or 69.7%) of the cases of TB disease reported in Colorado were among foreign-born individuals **(Figure 8 and Figure 9**).

As observed nationally, there exists an ethnic/racial disparity in Colorado specific to the distribution of TB disease among racial and ethnic minorities. The number of reported cases of TB in Colorado for the last decade has been highest among racial and ethnic minorities. The distribution of cases in 2013 is consistent with recent trends save 2012 which reflected some marked differences from past years. The biggest changes of note in 2013 were among White/Caucasians and Black/African-Americans. Among those self-identifying as White, cases increased from 5 in 2012 to 10 in 2013; a 100% increase. The most significant increase across the most-recent two years was seen among the Black/African American demographic. There were 19 cases in 2013, up from only 9 in 2012; a 110% increase. **S**ee **Figure 6 and Figure 7** for a full breakdown of race and ethnicity incidence.

In 2013, TB cases were reported among people ranging from 1 to 90 years of age. Over 32% of TB cases occurred among people 25-44 years old, followed by those aged 65+ years (28.4%) and 45-64 years (25.7%). Two cases of pediatric TB (<15 years of age) were reported in 2013. Of those two pediatric cases, both were younger than five years of age **(Figure 3).**

Due to the length of time it takes to complete TB drug treatment, completion rates are pending for 2013. Complete 2013 treatment completion data will be included in Colorado's 2014 Annual Surveillance Report in the spring of 2014. In 2012, (the most recent year for which robust treatment completion data are available), 60 of the 64 total cases were eligible to complete therapy. Of the 60 eligible cases, 59 (98.3%) completed therapy and one was lost to follow-up. Four other cases died (2 were dead at diagnosis and 2 died while on treatment; none were counted in the denominator.) Treatment completion data for 2013 will be described in more detail in the 2014 surveillance report when these data will be more complete. **Figure 11** includes updated 2012 treatment completion data, along with complete data for the previous eight years.

An individual with a medical history, physical exam, or chest x-ray suggestive of pulmonary TB, but who has a negative acid-fast bacilli (AFB) smear and culture and not diagnosed with active TB *or* has been diagnosed with TB and completes treatment overseas is classified as a Class B1. Those with a positive tuberculin skin test (TST) aged fifteen years or younger, and those with a chest x-ray not suggestive of TB are classified as Class B2. While data are still preliminary for 2013, there were 332 Class B notifications of which 320 were confirmed as arriving in Colorado. Of those 320 confirmed arrivals, 291 (90.9%) were evaluated. Five of those were found to have active TB disease. **Table 12** shows a breakdown of Class B data for 2008-2012 in Colorado.

Of the 74 TB cases in 2013, 48 (64.9%) had a positive culture. And of those 48, three were resistant to one or more of the four primary/first-line TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. Of those three cases, one was resistant to pyrazinamide alone; one was resistant to isoniazid and streptomycin; and one was resistant to isoniazid alone. There were no cases of multi-drug resistant TB (MDR) or extensively-drug resistant TB (XDR-TB) identified in 2013. See **Table 9** for a full break down of drug susceptibilities over the past five years.

While still preliminary, in 2012, 32 sputum smear positive or sputum smear negative/culture positive cases yielded 1,800 contacts. As a result of these investigations, three active cases of TB disease and 254 cases of TB infection were identified. Of those 254 cases, 246 have started LTBI treatment (96.9%) and 217 of those patients (88.2%) completed LTBI treatment. **Table 11** is a summary of contact investigations from 2003-2012.

Table 1. Demographic Comparison of 2012 and 2013 Active TB Cases

	2012		2013	
	n	% of cases	n	% of cases
Age Group (years)				
<15	3	4.7	2	2.7
15-24	11	17.2	8	10.8
25-44	13	20.3	24	32.4
45-64	17	26.6	19	25.7
65+	20	31.3	21	28.4
TOTAL	**64**	**100**	**74**	**100**
Gender				
Male	34	53.1	43	58.1
Female	30	46.9	31	41.9
TOTAL	**64**	**100**	**74**	**100**
Race/Ethnicity				
White	5	7.8	10	13.5
Black	9	14.1	19	25.7
Hispanic	29	45.3	24	32.4
American Indian/Alaska native	2	3.1	0	0
Asian/Pacific Islander	19	29.7	21	28.4
Multiple race	0	0	0	0
TOTAL	**64**	**100**	**74**	**100**
Region				
Denver metro[a]	41	64.1	53	71.6
Outside Denver metro	23	35.9	21	28.4
TOTAL	**64**	**100**	**74**	**100**
Country of Origin (U.S.- vs. Foreign-born)				
United States	19	29.7	16	21.6
Mexico	18	28.1	19	25.7
Other countries	27	42.2	39	52.7
TOTAL	**64**	**100**	**74**	**100**
HIV Status				
HIV Negative	61	95.3	65	87.8
HIV Positive	1	1.6	7	9.5
Testing done, results unknown	0	0	0	0
Refused testing	1	1.6	0	0
Not offered	1	1.6	2	2.7
Unknown	0	0	0	0
TOTAL	**64**	**100**	**74**	**100**
Risk factors[b]				
Birth in one of the 22 highest TB-burden countries[c]	14	21.9	22	29.7
Homeless within past year	4	6.3	6	8.1
Diabetes	11	17.2	12	16.2
Resident of correctional facility at diagnosis	2	3.1	2	2.7
Resident of long-term care facility	1	1.6	1	1.4
Injected drug use within past year	0	0	1	1.4
Non-injected drug use within past year	4	6.3	3	4.1
Excess alcohol use within past year	5	7.8	7	9.5
Health care worker within past year	2	3.1	2	2.7

Note: percentages may not equal 100 due to rounding.
a. Denver metro includes: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas and Jefferson counties.
b. A case may have more than one risk factor indicated.
c. According to the World Health Organization's definition of 22 highest-burden countries
http://www.who.int/tb/publications/global_report/2007/annex_1_download/en/index.html

Tuberculosis in Colorado: A Summary of Active Cases Reported in 2013

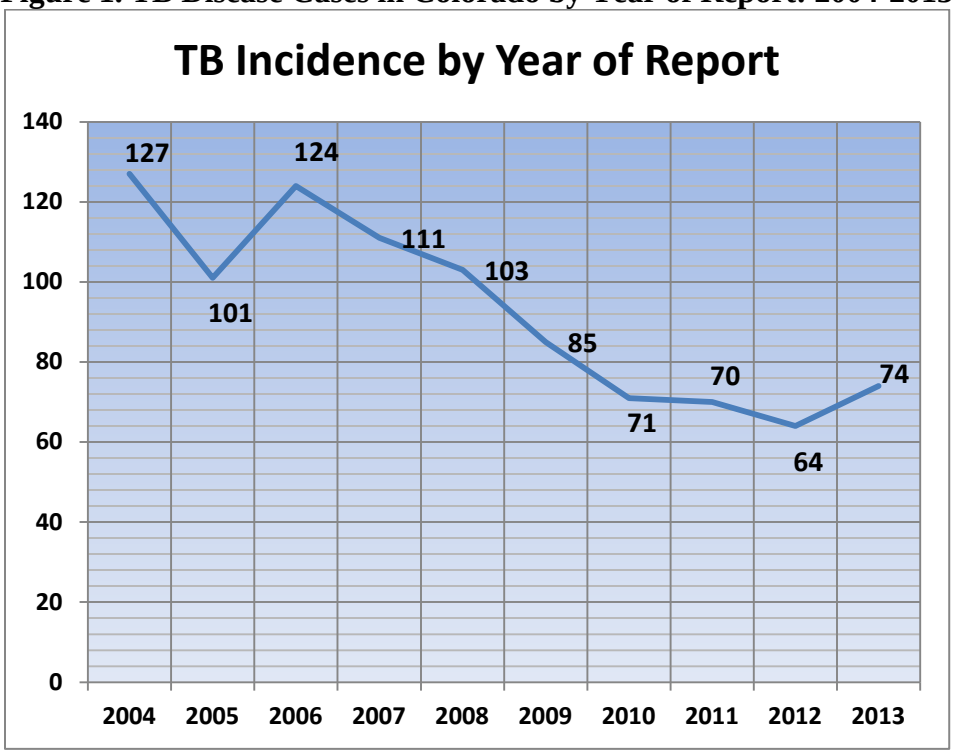
Tuberculosis Incidence

In 2013, a total of 74 active tuberculosis disease (TB) cases were reported in Colorado. As in most of the United States, despite 2013's uptick in cases, Colorado has documented a slow decline in TB cases and the incidence rate of TB over the past 10 years (**Table 2**). Colorado's incidence rate has dropped from 2.7 per 100,000 in 2004 to 1.4 during 2013. **Table 2** reflects active TB disease in Colorado and the United States over the past decade and **Figure 1** shows the 10 year trend in Colorado.

Table 2. Tuberculosis Cases and Incidence Rates per 100,000 Persons, Colorado and United States, 2004-2013

	Colorado		United States	
Year	**Cases**	**Rate**	**Cases**	**Rate**
2004	127	2.7	14,511	4.9
2005	101	2.1	14,093	4.8
2006	124	2.6	13,767	4.6
2007	111	2.3	13,293	4.4
2008	103	2.1	12,898	4.2
2009	85	1.7	11,483	3.8
2010	71	1.4	11,181	3.6
2011	70	1.4	10,465	3.4
2012	64	1.2	9,951	3.2
2013	74	1.4	9,588	3.0

Figure 1. TB Disease Cases in Colorado by Year of Report: 2004-2013



Tuberculosis Cases by County

Sixteen of Colorado's 64 counties reported a new case of active TB disease in 2013. Denver had the most with 21 new cases, followed by Arapahoe (14), El Paso (8), Adams (7), and Boulder (6) counties **(Figure 2, Table 3).**

Figure 2. TB in Colorado: 2013 TB Cases by County

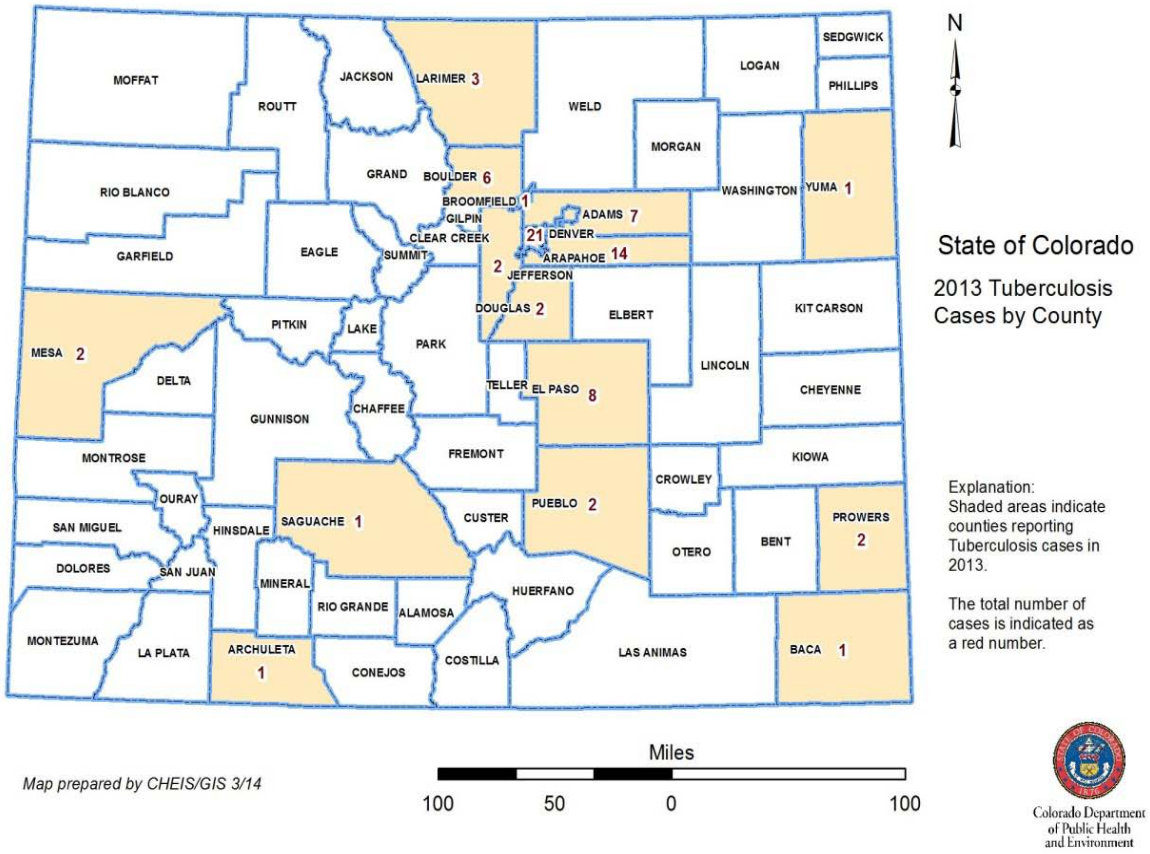


Table 3. TB in Colorado: Cases by County and Year of Report 2004-2013

County	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Adams*	13	6	17	14	14	4	6	10	8	7
Alamosa	0	1	0	0	0	0	0	0	0	0
Arapahoe*	18	17	22	17	14	11	17	5	9	14
Archuleta	0	0	0	0	0	0	0	0	0	1
Baca	0	0	0	0	0	0	0	0	0	1
Bent	0	0	0	1	0	0	0	0	0	0
Boulder	2	3	7	5	7	3	0	5	9	6
Broomfield	0	1	0	0	0	0	1	0	0	1
Clear Creek	0	0	0	0	0	1	0	0	0	0
Conejos	0	0	1	0	2	0	0	0	0	0
Crowley	1	0	0	0	0	0	0	0	0	0
Delta	0	0	0	1	0	1	0	0	0	0
Denver	47	42	40	37	24	29	24	23	11	21
Douglas*	3	0	1	2	3	4	1	2	1	2
Eagle	0	1	0	0	1	2	0	0	1	0
El Paso	9	9	10	7	10	7	8	7	5	8
Fremont	0	1	0	1	0	1	1	0	0	0
Garfield	0	0	2	2	1	2	0	0	0	0
Grand	2	1	2	0	0	0	0	0	0	0
Gunnison	0	0	0	0	0	2	0	0	0	0
Huerfano	0	0	0	0	0	0	1	0	0	0
Jefferson	10	5	5	9	12	8	0	8	3	2
Kit Carson	0	0	0	0	0	0	1	0	0	0
La Plata	1	0	0	0	0	0	0	0	1	0
Lake	0	0	0	1	1	0	0	0	0	0
Larimer	2	2	4	2	3	2	5	2	4	3
Las Animas	0	0	0	2	1	2	0	0	0	0
Logan	0	1	0	0	1	0	0	0	0	0
Mesa	0	0	0	0	0	1	0	1	1	2
Moffat	0	1	0	0	0	0	0	0	0	0
Montezuma	2	0	0	1	0	0	0	0	0	0
Morgan	1	2	0	2	1	1	0	2	1	0
Otero	0	0	1	0	1	0	0	0	0	0
Phillips	0	1	0	0	0	0	0	0	0	0
Pitkin	0	1	2	0	0	0	0	0	0	0
Prowers	0	0	0	0	0	0	0	0	0	2
Pueblo	3	3	2	4	3	1	2	1	1	2
Rio Blanco	1	0	0	0	0	0	0	0	0	0
Rio Grande	0	0	0	1	0	0	1	0	0	0
Saguache	0	0	0	0	1	0	0	0	0	1
Sedgwick	1	0	0	0	0	0	0	0	0	0
Summit	2	0	1	0	0	0	1	0	1	0
Teller	0	0	0	0	0	1	0	0	1	0
Weld	9	3	5	1	3	2	2	4	7	0
Yuma	0	0	2	1	0	0	0	0	0	1
TOTAL	**127**	**101**	**124**	**111**	**103**	**85**	**71**	**70**	**64**	**74**

Note: Only counties reporting an active case of TB (2004-2013) are included.
Note2: Highlighted counties reported at least one case of active TB in 2013.
* Tri-County Health Department comprises Adams, Arapahoe, and Douglas Counties.

The county-specific five-year mean incidence rates are provided in **Table 4**. Eighteen counties (28% of all counties) have an average incidence rate equal to or greater than the average state incidence rate of 1.4 per 100,000 over the same five-year period, though several counties have too few cases for those mean incidence rates to be significant.

Table 4. TB in Colorado: 2009-2013 Mean Incidence Rates* by County (Reporting at least one case)

						5-Year Incidence Rates 2008-2012
County	**2009**	**2010**	**2011**	**2012**	**2013**	
Adams	0.9	1.3	2.2	1.7	1.5	1.5
Arapahoe	1.9	2.9	0.9	1.5	2.3	1.9
Archuleta	0.0	0.0	0.0	0.0	8.0	1.6
Baca	0.0	0.0	0.0	0.0	26.8	5.3
Boulder	1.0	0.0	1.7	3.0	1.9	1.5
Broomfield	0.0	1.8	0.0	0.0	1.7	0.7
Clear Creek	10.9	0.0	0.0	0.0	0.0	2.2
Delta	3.1	0.0	0.0	0.0	0.0	0.6
Denver	4.7	3.8	3.8	1.8	3.2	3.4
Douglas	1.4	0.3	0.7	0.3	0.7	0.7
Eagle	3.7	0.0	0.0	1.9	0.0	1.1
El Paso	1.2	1.3	1.1	0.8	1.2	1.1
Fremont	2.1	2.0	0.0	0.0	0.0	0.8
Garfield	3.5	0.0	0.0	0.0	0.0	0.7
Gunnison	13.0	0.0	0.0	0.0	0.0	2.6
Huerfano	0.0	14.4	0.0	0.0	0.0	3.0
Jefferson	1.5	0.0	1.5	0.6	0.4	0.8
Kit Carson	0.0	11.5	0.0	0.0	0.0	2.4
La Plata	0.0	0.0	0.0	1.9	0.0	0.4
Larimer	0.7	1.7	0.7	1.3	0.9	1.0
Las Animas	12.1	0.0	0.0	0.0	0.0	2.5
Mesa	0.7	0.0	0.7	0.7	1.3	0.7
Morgan	3.5	0.0	7.0	3.5	0.0	2.8
Prowers	0.0	0.0	0.0	0.0	16.0	3.2
Pueblo	0.6	1.2	0.6	0.6	1.2	0.9
Rio Grande	0.0	7.9	0.0	0.0	0.0	1.6
Saguache	0.0	0.0	0.0	0.0	15.4	3.0
Summit	0.0	3.4	0.0	3.5	0.0	1.4
Teller	4.4	0.0	0.0	4.3	0.0	1.7
Weld	0.8	0.8	1.5	2.7	0.0	1.1
Yuma	0.0	0.0	0.0	0.0	9.9	2.0
Colorado	**1.7**	**1.4**	**1.4**	**1.2**	**1.4**	**1.4**

***TB disease per 100,000 persons**

Note: Denominators for computing the rate of tuberculosis throughout this report are from the Colorado Division of Local Government, State Demography Office.

Note 2: Incidence rates based on fewer than five health events are likely to be unstable and imprecise.

Tuberculosis by Age Group

In 2013, TB cases were reported among people ranging from 1 to 90 years of age. Over 32% of TB cases occurred among people 25-44 years old, followed by those aged 65+ years (28.4%) and 45-64 years (25.7%). Two cases of pediatric TB (<15 years of age) were reported in 2013. Active TB in children is particularly concerning, as it indicates ongoing transmission in the community as well as evidence of missed opportunities for preventive therapy. Of those two pediatric cases, both were younger than five years of age **(Figure 3).**

Figure 3. 2013 Active TB Cases by Age Group (n=74)

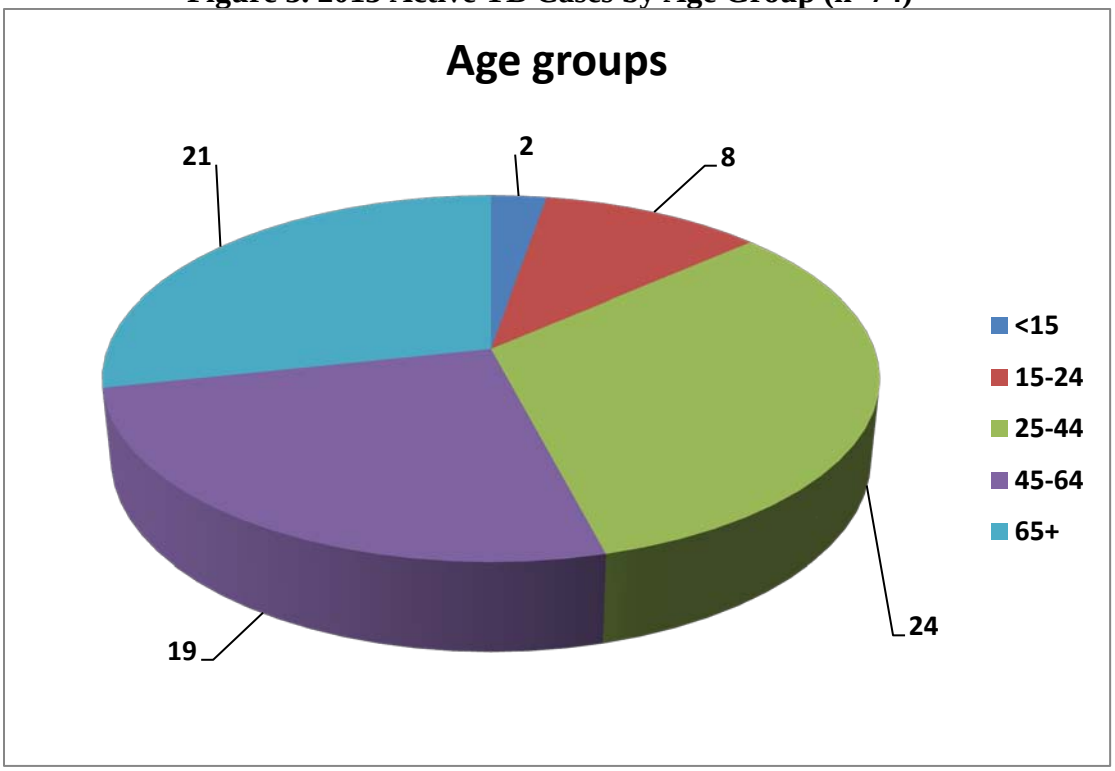


Table 5 shows that in 2013 the highest TB incidence rate was among persons 85+ years of age (6.3 cases per 100,000) and lowest (among groups with at least one documented case) among those 15-19 years and those 35-39 years (both 0.6 cases per 100,000). There were no significant reduction among age groups between 2012 and 2013. In contrast, there was a significant increase in TB cases among those 40-44 years old over the same period from 1 case in 2012 to 9 cases in 2013. **Table 6** shows the age groups relative to nativity (U.S.-born and foreign-born). As expected, the foreign-born population bares a disproportionate burden of TB disease given their small state-wide numbers compared to the U.S.-born cohort in the state. While less than ten percent of Colorado's population is foreign-born, foreign-born cases of TB make up almost 78% of all TB cases reported in the state in 2013.

Table 5. TB in Colorado: 2012 & 2013 Reported Cases by Gender and Age Group

	2012				2013			
Age Group	**Male**	**Female**	**Total**	**Rate***	**Male**	**Female**	**Total**	**Rate***
0 to 4	0	0	0	0	0	2	2	0.6
5 to 9	0	0	0	0	0	0	0	0
10 to 14	1	2	3	0.9	0	0	0	0
15 to 19	3	1	4	1.1	2	0	2	0.6
20 to 24	3	4	7	2.0	4	2	6	1.7
25 to 29	2	2	4	1.1	5	3	8	2.2
30 to 34	3	2	5	1.3	2	3	5	1.3
35 to 39	1	2	3	0.9	1	1	2	0.6
40 to 44	0	1	1	0.3	3	6	9	2.5
45 to 49	3	4	7	2.0	5	1	6	1.7
50 to 54	4	2	6	1.6	4	2	6	1.6
55 to 59	2	0	2	0.6	3	2	5	1.4
60 to 64	2	0	2	0.7	2	0	2	0.7
65 to 69	3	2	5	2.3	3	1	4	1.7
70 to 74	4	1	5	3.5	4	3	7	4.5
75 to 79	1	4	5	4.9	2	1	3	2.8
80 to 84	1	0	1	1.3	2	0	2	2.5
85+	1	3	4	5.3	1	4	5	6.3
TOTAL	**34**	**30**	**64**	**1.2**	**43**	**31**	**74**	**1.4**

Note: Incidence rates based on fewer than five health events are likely to be unstable and imprecise. *Rates per 100,000 persons.

Table 6. TB in Colorado: 2012 & 2013 Case Comparison by Age Group and Patient Nativity

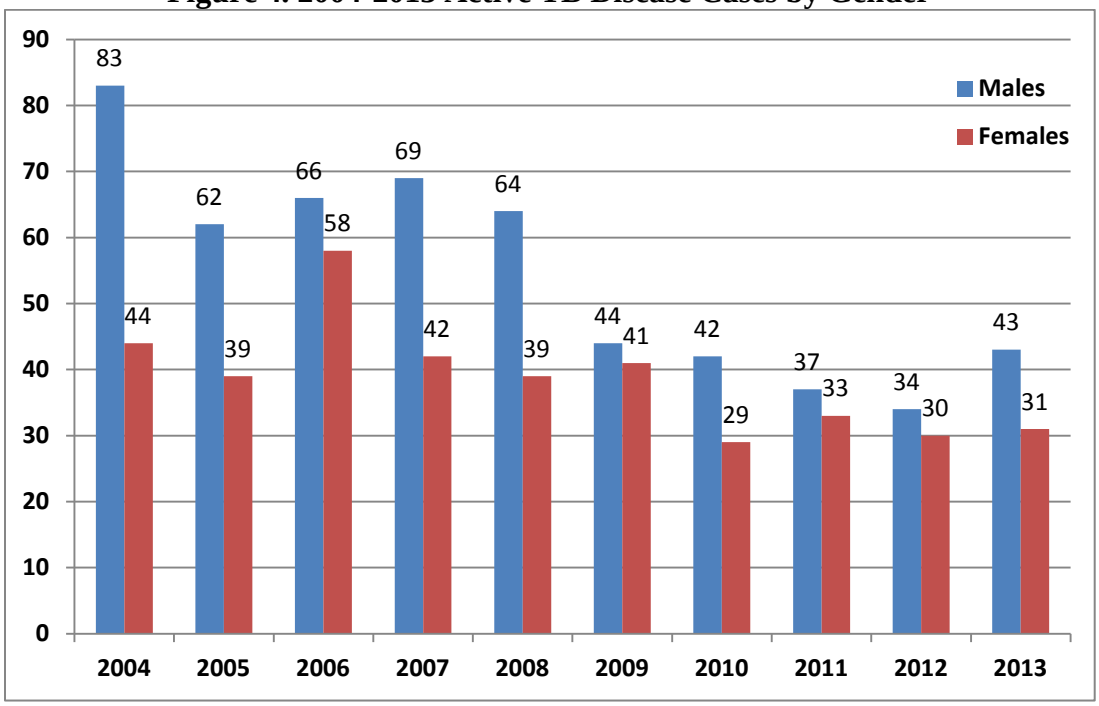
	2012			2013		
Age Group	**U.S.-Born**	**Foreign-Born**	**Total**	**U.S.-Born**	**Foreign-Born**	**Total**
0-4	0	0	0	1	1	2
5-14	1	2	3	0	0	0
15-24	2	9	11	1	7	8
25-34	1	8	9	1	12	13
35-44	1	3	4	3	8	11
45-54	5	8	13	3	9	12
55-64	1	3	4	3	4	7
65-74	4	6	10	3	8	11
75-84	3	3	6	0	5	5
85+	1	3	4	1	4	5
TOTAL	**19**	**45**	**64**	**16**	**58**	**74**

Tuberculosis by Gender

Tuberculosis tends to infect and lead to active TB disease in males more often than females. This finding may be due to disparities in access to health care, differing health-seeking behaviors, underlying biological susceptibility to TB and/or the distribution of

risk factors such as substance abuse, incarceration (living in a congregate setting), and homelessness. Gender-specific cases over the last 10 years are found in **Figure 4**. In 2013, the usual TB gender disparity was less-pronounced than in some previous years with 43 males (58.1% of total; comparable with 53.1% in 2012) and 31 females.

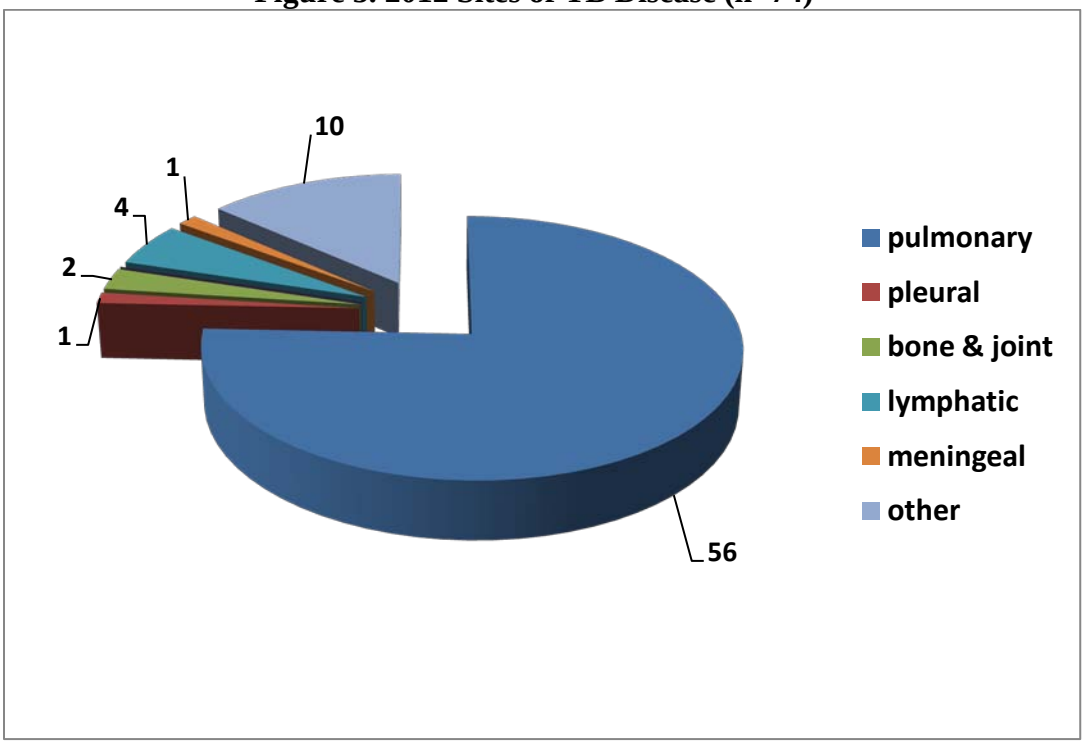
Figure 4. 2004-2013 Active TB Disease Cases by Gender



Tuberculosis Cases by Major Site of Disease

Tuberculosis most often attacks the lungs (pulmonary TB), but may affect any part of the body (extrapulmonary TB), including the kidneys, spine or brain, lymph nodes, bones or joints, and genitourinary tract. In 2013, 56 of the 74 (75.7%) cases were pulmonary or had both a pulmonary and extrapulmonary site of disease, which is consistent with recent years' surveillance. The next most common site of infection in 2013 was the "other" category (1-shoulder, 1-brain, 3-eye, 1-pericardial, 2-colon, 2-skin, and 1-liver), followed by the lymph system (cervical, intrathoracic or axillary) with 4 cases (5.4%). There were no cases of M. bovis infection or instances of genitourinary sites of disease in 2013. **Figure 5** shows the major anatomical sites of TB disease among 2012 cases.

Figure 5. 2012 Sites of TB Disease (n=74)



Tuberculosis by Race/Ethnicity

The number of reported cases of TB in Colorado for the last decade has been highest among racial and ethnic minorities. The distribution of cases in 2013 is consistent with recent trends save 2012 which reflected some marked differences from past years. The biggest changes of note in 2013 were among White/Caucasians and Black/African-Americans. Among those self-identifying as White, cases increased from 5 in 2012 to 10 in 2013; an increase of 100%. The most significant increase across the most-recent two years was seen among the Black/African American demographic. There were 19 cases in 2013, up from only 9 in 2012; a 110% increase. As observed nationally, there also exists an ethnic/racial disparity in Colorado specific to the distribution of TB disease among racial and ethnic minorities. This is a major concern to the state of Colorado's TB Program. In 2013 for instance, Black/African American persons comprised roughly 4% of the total population of the state, yet represented 25.7% of all active TB cases. Persons self-identifying as of Hispanic origin made up roughly 22% of the total Colorado population, yet they represented over 32% of all active TB cases in 2013. **See Figure 6 and Figure 7** for a full breakdown of race and ethnicity incidence. There were no cases among American Indian/Alaska Natives or those self-identifying as of multiple races.

Figure 6. 2004-2013: TB Cases Self-Identifying as White vs. Non-White

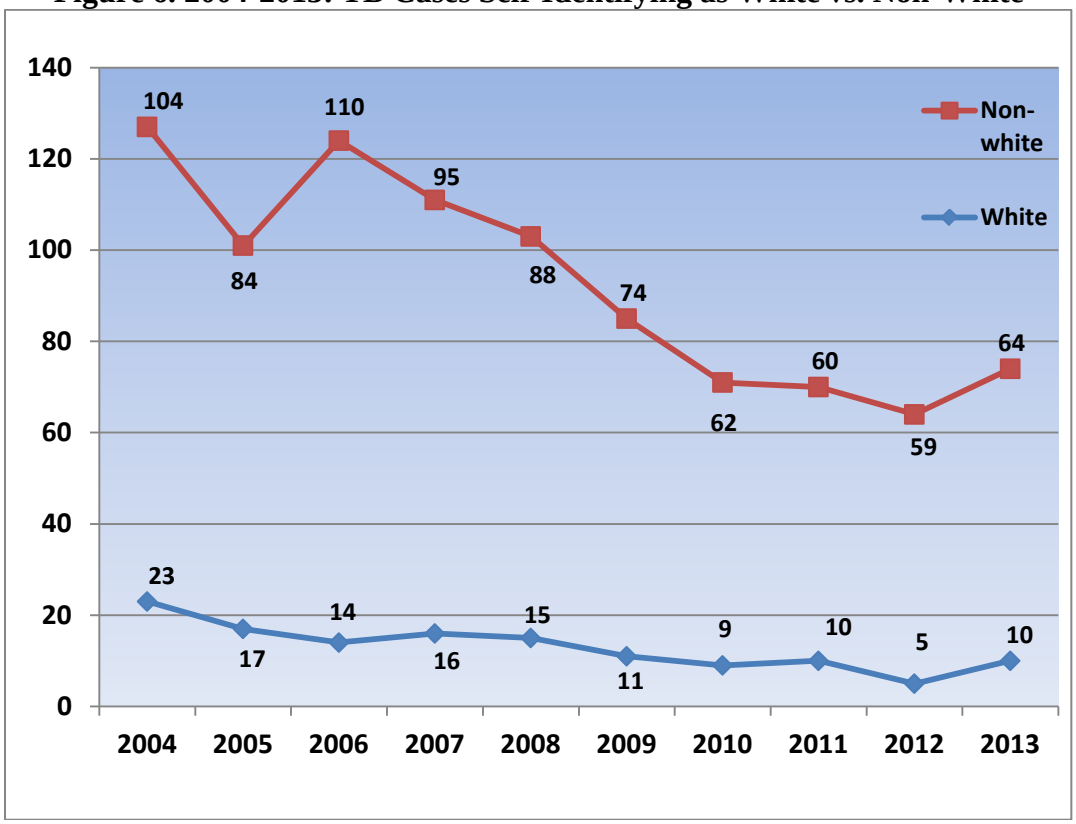
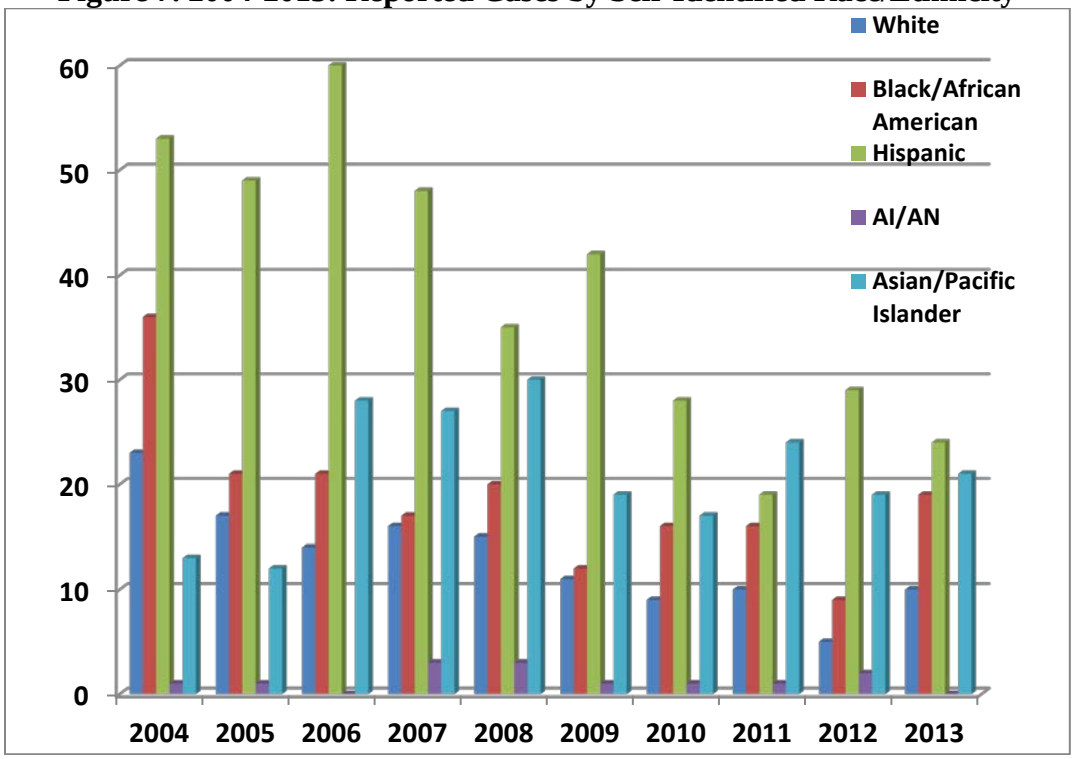


Figure 7. 2004-2013: Reported Cases by Self-Identified Race/Ethnicity



The United States Centers for Disease Control and Prevention (CDC) considers Colorado a low-incidence state in relation to reportable TB disease (defined as an incidence rate less than 3.5 per 100,000 persons); however, incidence rates in the Black/African-American and Asian/Pacific Islander populations both exceeded the "low-incidence" threshold. **Table 7** compares race and ethnicity TB incidence rates from 2012 and 2013.

Table 7. TB in Colorado: 2012 and 2013 Cases by Race/Ethnicity

	2012		2013	
Race/ethnicity	**Number of Cases (% of total)**	**Incidence Rate***	**Number of Cases (% of total)**	**Incidence Rate***
White/Caucasian	5 (7.8)	0.1	10 (13.5)	0.2
Black/African-American	9 (14.1)	4.7	19 (25.7)	9.6
Hispanic	29 (45.3)	2.8	24 (32.4)	2.2
Asian/Pacific Islander	19 (29.7)	14.0	21 (28.4)	14.6
American Indian/AK native	2 (3.1)	7.3	0	0
TOTAL	**64 (100)**	**1.2**	**74 (100)**	**1.4**

*Per 100,000 persons

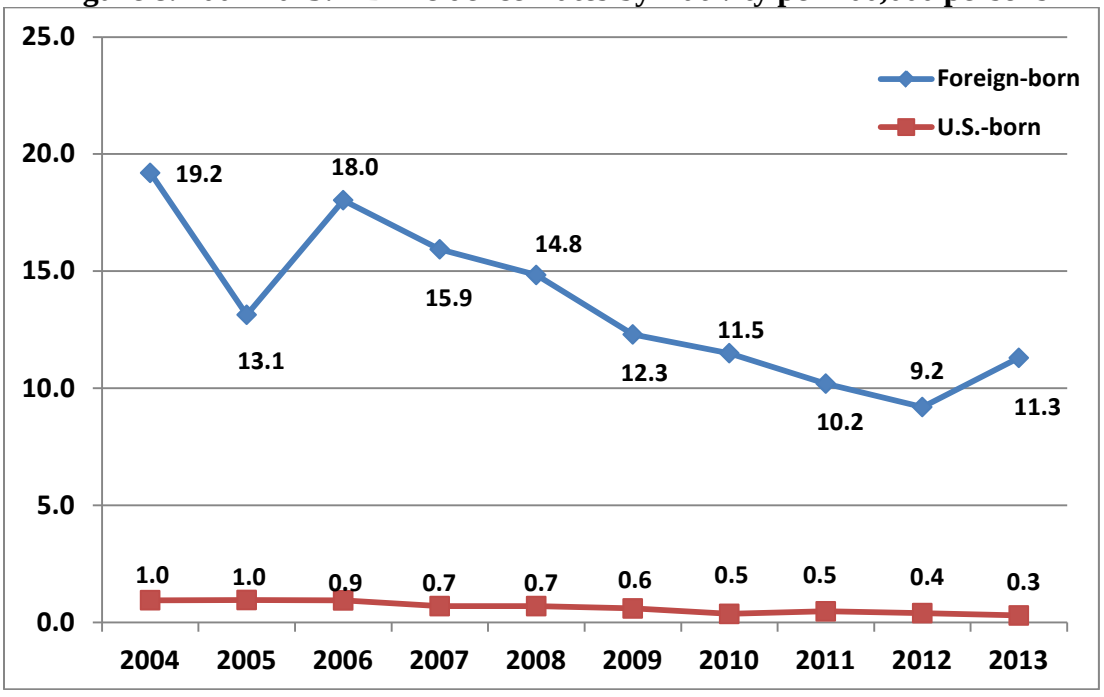
Note: Incidence rates based on fewer than five health events are likely to be unstable and imprecise.

Note2: percentages may not equal 100 due to rounding.

TB Incidence Rates by Nativity

In 2013, the TB incidence rate in the foreign-born population living in Colorado was 11.3 per 100,000 persons, which is 37 times higher than that of the U.S.-born population (0.3 per 100,000). This is a significant increase from past two years. Since 2004, more than two-thirds (648 of 930 cases or 69.7%) of the cases of TB disease reported in Colorado were among foreign-born individuals **(Figure 8 and Figure 9**). The U.S.-born rate remains consistently low over past five years.

Figure 8. 2004-2013: TB Incidence Rates by Nativity per 100,000 persons



In 2013, 58 foreign-born cases of TB disease were reported in Colorado, representing 78.4% of all cases for the year, up from 70.3% in 2012. The largest single foreign-born cohort came from Mexico with 19 cases. One of the most striking surveillance trends over the past three years has been the proportional increase in U.S.-born cases. In fact, the U.S.-born TB cohort has been the largest of any single country in both 2011 and 2012 and just behind Mexico in 2013 (19 vs. 16 cases); sixteen of 74 cases in 2013 (21.6% of total) were born in the U.S. while Mexico's cohort of 19 represented 25.7% of 2013's total. **Table 8** shows a breakdown of the countries of origin for all active cases of TB disease from 2009-2013. The 2013 cases are highlighted. Of those foreign-born cases (n=58), 22 (37.9%) came from one of the top 22 highest-burdened countries that comprise 80% of all global cases of active TB disease.

Figure 9. 2004-2013: Reported TB Cases U.S.- vs. Foreign-born

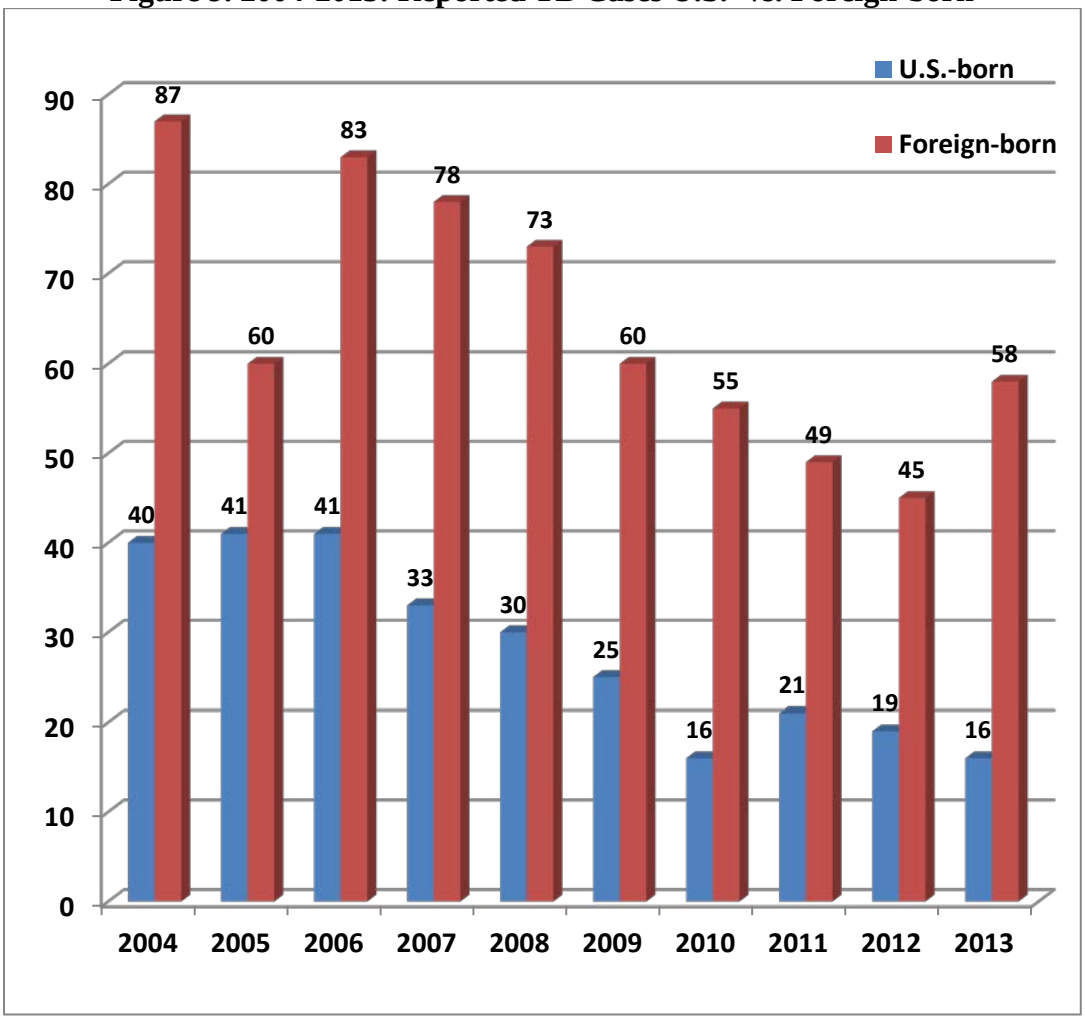


Table 8. Comparison of Colorado TB Cases by Country of Origin, 2009-2013

Country	2009	2010	2011	2012	2013
Austria	1	0	0	0	0
Afghanistan*	0	0	0	0	2
Bangladesh*	0	2	0	0	0
Bhutan	2	1	1	2	2
Burma/Myanmar*	1	2	1	0	3
Burundi	0	0	0	1	0
Canada	0	1	0	0	0
China*	0	1	1	2	2
Cuba	0	0	0	0	0
Democratic Rep. of Congo*	0	0	1	0	2
El Salvador	1	0	0	0	0
Eritrea	0	1	2	0	2
Ethiopia*	3	4	2	3	6
Fiji	0	0	1	0	0
Germany	0	1	0	0	0
Ghana	0	0	0	0	1
Greece	0	0	0	0	1
Guam	0	1	0	0	0
Guatemala	1	0	0	0	0
Haiti	0	0	0	1	0
Honduras	1	0	1	1	0
India*	5	1	4	3	3
Indonesia*	1	2	1	1	1
Italy	0	0	1	0	0
Jamaica	0	1	0	0	0
Kenya*	3	0	2	1	0
Korea	0	1	2	0	1
Laos	0	0	1	2	2
Liberia	0	1	0	0	0
Mexico	26	22	12	18	19
Micronesia	0	0	0	1	0
Mongolia	1	0	0	0	0
Nepal	2	0	3	4	2
Pakistan*	0	0	1	0	0
Palau	0	1	0	0	0
Peru	1	1	0	1	1
Philippines*	3	3	2	2	1
Poland	0	0	0	0	1
Russian Federation	0	0	0	0	1
Rwanda	1	1	0	0	0
Senegal	0	1	0	0	0
Somalia	2	4	5	0	1
Sudan	0	0	0	0	2
Taiwan	0	0	1	0	0
Thailand	0	0	0	0	2
Tonga	0	0	1	0	0
U.S.	25	16	21	19	16
Viet Nam*	5	2	3	2	0
Total cases	**85**	**71**	**70**	**64**	**74**

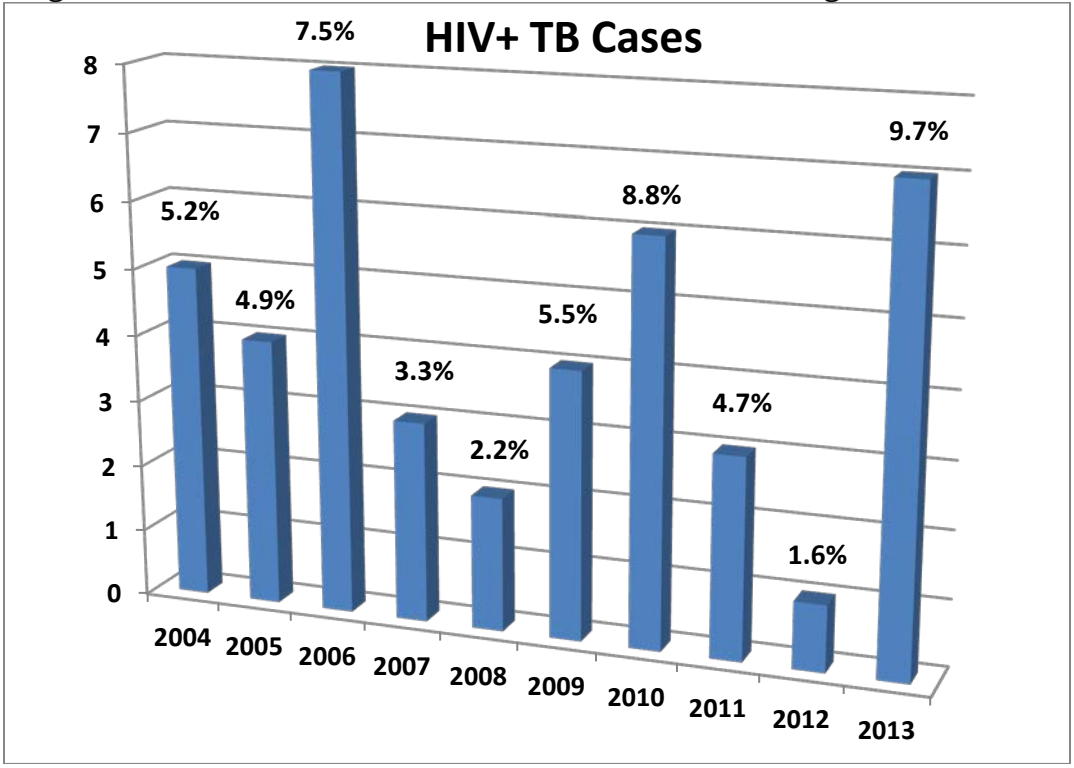
Note: only 2013 cases and corresponding countries of origin are highlighted

*Denotes one of the 22 highest-TB burden countries that constitute ~80% of global TB cases

HIV Co-infection

Worldwide, one in four people with HIV who die of AIDS-defining conditions do so as a result of TB complications. HIV-infected people with latent TB infection (LTBI) are at higher risk of active TB since HIV weakens the immune system, greatly increasing the likelihood of progression from TB infection to active TB disease. Of the 74 cases of TB in 2013, recent test results for HIV were available for 72 (97.3% of total cases.) Of those 72, seven people were found to be co-infected with HIV. This is evidence that universal HIV testing among TB patients is working. Among the two outliers; neither was offered an HIV test. 2013 saw the highest percentage of HIV+ TB patients in the past ten years. This was a huge increase from the previous year when only one case was co-infected. Until every person with active TB disease is offered an HIV test that includes an explanation of the medical necessities for such a test, this will remain an area for improvement. **Figure 10** shows the total number of HIV cases among TB patients over the last 10 years, as well as the percentage of the annual cases with HIV/TB co-morbidity.

Figure 10. 2004-2013: HIV Positive TB Cases and Percentage of Total Cases



Drug Resistance and TB

There were far fewer instances of lab-confirmed drug resistance in the 2013 cohort than compared to cases the previous four years. Of the 74 TB cases in 2013, 48 (64.9%) had a positive culture. And of those 48, three were resistant to one or more of the four primary/first-line TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. Of those three cases, one was resistant to pyrazinamide alone; one was resistant to isoniazid and streptomycin; and one was resistant to isoniazid alone. There were no cases of multi-drug

resistant TB (MDR) or extensively-drug resistant TB (XDR-TB) identified in 2013. See **Table 9** for a full break down of drug susceptibilities over the past five years.

Table 9. TB in Colorado: 2009-2013 Drug Susceptibilities

	2009	2010	2011	2012	2013
TB Drug(s)	**Number Resistant**	**Number Resistant**	**Number Resistant**	**Number Resistant**	**Number Resistant**
isoniazid only	3	5	4	0	1
pyrazinamide only	3	2	4	3	1
ethambutol only	0	0	1	0	0
isoniazid and streptomycin	3	0	1	1	1
isoniazid and rifampin	0	0	0	1	0
pyrazinamide and streptomycin	1	0	0	0	0
streptomycin only	1	1	1	2	0
streptomycin and ethionamide	0	0	0	0	0
isoniazid, streptomycin and ethambutol	0	0	1	0	0
isoniazid, streptomycin and ethionamide	0	0	0	0	0
isoniazid, rifampin, ethambutol, pyrazinamide and streptomycin	0	1	1	0	0
rifampin, ethambutol & streptomycin	0	0	0	1	0
Total	**11**	**9**	**13**	**8**	**3**

Directly Observed Therapy (DOT)

Directly observed therapy (DOT) is the standard of care for administering TB medications to patients with active TB disease. Directly observed therapy is required for all pulmonary cases of TB in Colorado and involves health care workers observing the patient taking his/her medications to ensure compliance with, and completion of, the treatment regimen. During 2012 (the most recent year with complete data), there were 62 patients who were treated for active TB disease; two others was dead at TB diagnosis. All 62 received TB treatment through DOT, self-administered treatment or a combination of both. To date in 2013, DOT data is available for 46 patients; of those, five were SAT only, two were DOT and SAT, and 39 were DOT only. **Table 10** presents the number and percentage of cases receiving DOT in 2011 and 2012 along with preliminary 2013 data.

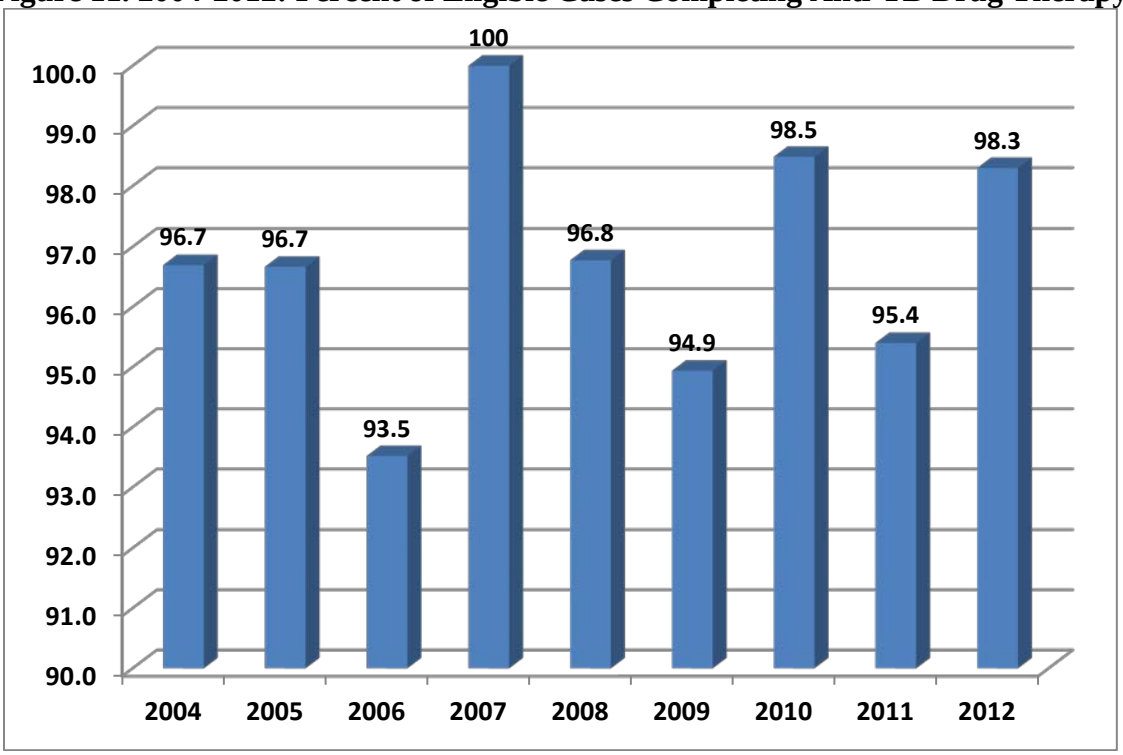
Table 10. Number & Percentage of Patients Receiving DOT and/or SAT: 2011-2013

	2011		2012		2013*	
	N	%	N	%	N	%
DOT only	59	84.3	51	79.7	39	83.0
DOT + self administered	6	8.6	8	12.5	2	4.3
Self administered only	3	4.3	3	4.7	5	10.6
Dead at diagnosis	2	2.9	2	3.1	1	2.1
TOTAL	**70**	**100**	**64**	**100**	**47**	**100**
*2013 data are preliminary; 35 of 74 cases have pending DOT data						

Completion of TB Treatment

The standard treatment for active TB disease is six months in duration and utilizes the four "first-line" TB drugs: isoniazid, pyrazinamide, rifampin, and ethambutol. In 2012, (the most recent year for which robust treatment completion data are available), 60 of the 64 total cases were eligible to complete therapy. Of the 60 eligible cases, 59 (98.3%) completed therapy, one was lost to follow-up, and four died (2 dead at diagnosis and 2 died while on treatment were not counted in the denominator.) Treatment completion data for 2013 will be described in more detail in the 2014 surveillance report when these data will be more complete. **Figure 11** includes updated 2012 treatment completion data, along with complete data for the previous eight years.

Figure 11. 2004-2012: Percent of Eligible Cases Completing Anti-TB Drug Therapy



Contact Investigations

The Colorado Department of Public Health and Environment's TB Program is responsible for TB control throughout the state of Colorado, which includes the public health imperative to conduct contact investigations on all cases of infectious (pulmonary,

pleural and laryngeal) TB. Contacts to infectious TB patients are 75 times more likely to be infected with TB than the general public, making it critical to locate, evaluate, and treat infected contacts. **Table 11** is a summary of contact investigations from 2003-2012 (2012 data is preliminary and preliminary data for 2013 will be available when the 2014 surveillance report is completed.) While still preliminary, in 2012, 32 sputum smear positive or sputum smear negative/culture positive cases yielded 1,800 contacts. As a result of these investigations, four active cases of TB disease and 254 cases of TB infection were identified. Of those 254 cases, 246 have started LTBI treatment (96.9%) and 217 of those patients (88.2%) completed LTBI treatment.

Table 11. Follow-up and Treatment for Contacts to Active Tuberculosis Cases, 2003-2012

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Number of sputum smear positive or sputum smear negative, culture positive cases	45	48	44	64	40	44	41	34	38	32
Total contacts	593	1,462	1,317	1,523	594	1,185	490	602	493	1800
Average contacts per infectious case	13.1	30.5	29.9	23.7	14.8	26.9	11.9	17.8	13.0	56.3
Number (%) of contacts evaluated*	489 (82%)	1,170 (80%)	1,113 (85%)	1,290 (85%)	432 (73%)	998 (84%)	447 (91%)	560 (93%)	388 (79%)	1614 (90%)
Number (%) of contacts with latent TB infection	111 (23%)	351 (30%)	220 (20%)	274 (21%)	127 (29%)	160 (16%)	176 (39%)	138 (25%)	84 (22%)	254 (16%)
Number (%) of infected contacts starting treatment	89 (80%)	276 (79%)	179 (81%)	217 (79%)	101 (79%)	128 (80%)	149 (85%)	131 (95%)	67 (80%)	246 (97%)
Number (%) of contacts starting treatment who completed treatment	63 (71%)	187 (68%)	129 (72%)	146 (67%)	83 (82%)	82 (63%)	108 (72%)	106 (81%)	61 (91%)	217 (88%)
Number (%) of contacts with active TB disease	3 (<1%)	16 (1%)	7 (<1%)	9 (<1%)	3 (<1%)	2 (<1%)	2 (<1%)	6 (1.1%)	3 (<1%)	4 (<1%)

Note: Evaluated = symptom check and tuberculin skin test/IGRA, chest x-ray, sputum studies as indicated.
*2012 data are preliminary; preliminary 2013 data to follow in 2014 Surveillance Report.

Class B Evaluations

Immigrants and refugees who are traveling to the United States are evaluated for TB prior to arriving (as required by U.S. immigration law) and assigned a classification according to the status of their disease. An individual with a medical history, physical exam, or chest x-ray suggestive of pulmonary TB, but who has a negative acid-fast bacilli (AFB) smear and culture and not diagnosed with active TB *or* has been diagnosed with TB and completes treatment overseas is classified as a Class B1. Those with a positive tuberculin skin test (TST) aged fifteen years or younger, and those with a chest x-ray not suggestive of TB are classified as Class B2. The Division of Global Migration and Quarantine notifies CDPHE's TB Program of all class B1 and B2 individuals who are entering the state. The CDPHE TB Program forwards these referrals to the local health departments in the counties where the individual will reside. The local health departments provide medical evaluations and treatment for infection, whether active or latent. While data are still preliminary for 2013, there were 332 Class B notifications of which 320 were confirmed as arriving in Colorado. Of those 320 confirmed arrivals, 291 (90.9%) were evaluated. Five of those were found to have active TB disease. **Table 12** shows a breakdown of Class B data for 2008-2012 in Colorado.

Table 12. Colorado Class BTB Data 2009-2013

	2009		2010		2011		2012		2013*	
	n	%	n	%	n	%	n	%	n	%
Class B notifications	312		325		303		412		332	
Moved prior to evaluation	16	5.1%	25	7.7%	24	7.9%	19	4.6%	12	3.6%
Arrivals	296	94.9%	300	92.3%	279	92.1%	393	95.4%	320	96.4%
Evaluated	215	72.6%	259	86.3%	260	93.2%	372	94.7%	291	90.9%
TB disease	2	0.9%	5	1.9%	2	0.8%	3	0.8%	5	1.7%
INH recommended	114	53.0%	102	39.4%	102	39.2%	125	33.6%	82	28.2%
Start treatment	93	81.6%	83	81.4%	85	83.3%	93	74.4%	54	65.9%
Complete treatment	74	79.6%	73	88.0%	77	90.6%	83	89.2%	29	53.7%
On treatment	0	0.0%	0	0.0%	0	0.0%	0	0.0%	22	40.7%

*preliminary data

Figures 12 and **13** highlight evaluation rates and treatment completion rates over five years among refugees and immigrants with national averages (green line) and state objectives (yellow line). The results illustrate the above average rates for evaluation and treatment completion for those groups in Colorado.

Figure 12.

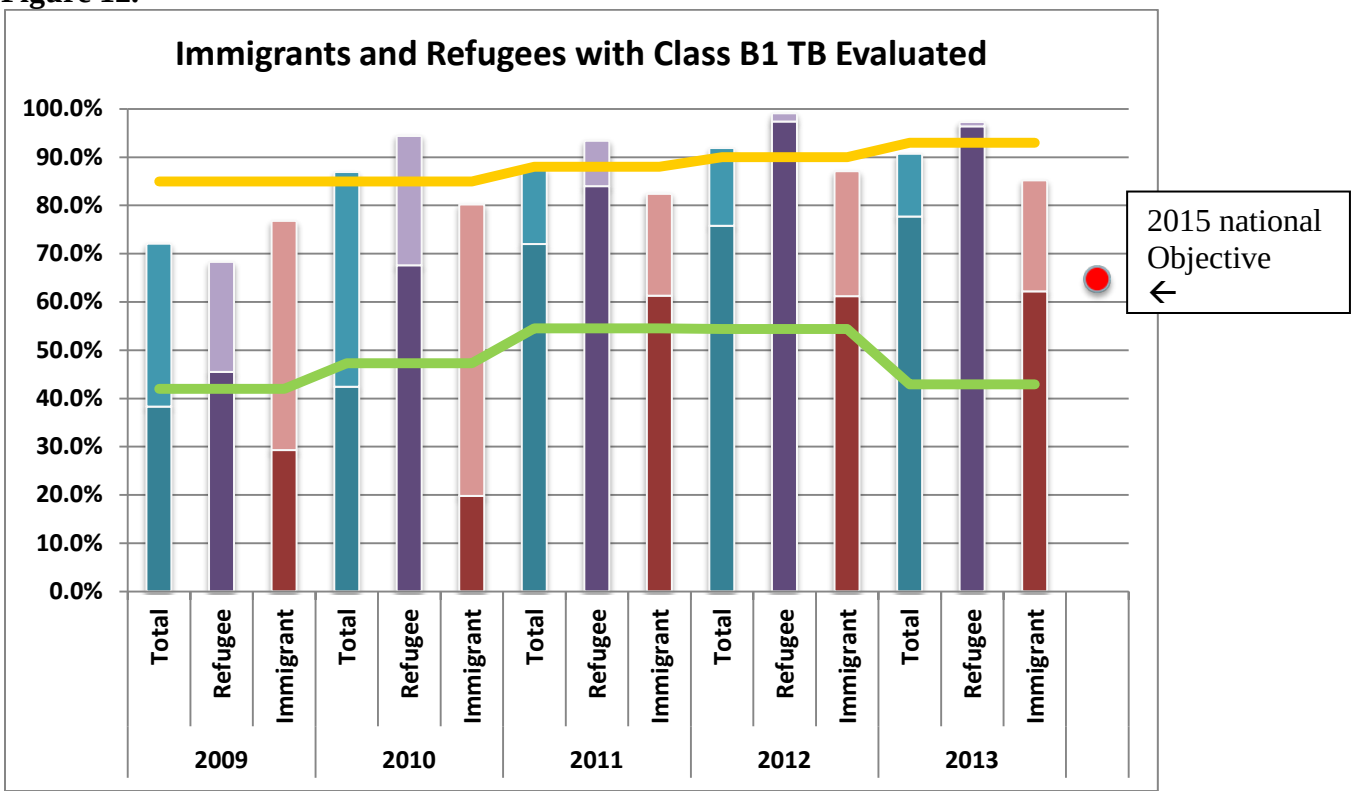
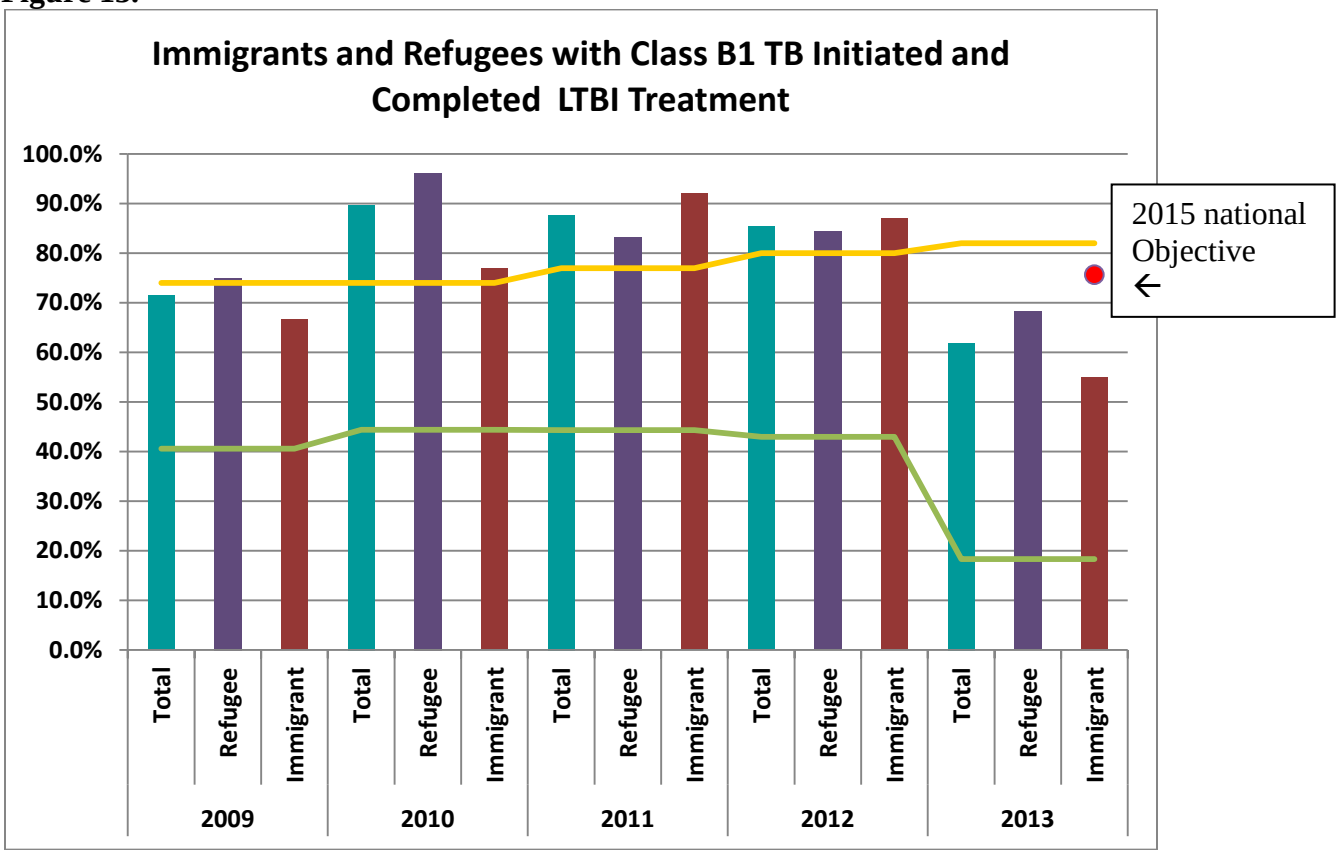


Figure 13.



Moving Forward

The Colorado Department of Public Health and Environment's TB Program maintains close working partnerships with local health departments, regional states' TB programs, as well as federal agencies in collaborative efforts to prevent, screen for, and treat TB in Colorado. While cases of TB plateau or even decline, the importance of tracking and ensuring treatment completion will remain paramount. Emphasis on completion of treatment requires close collaboration with local health departments and other partners to prevent both the further spread of the disease and the emergence of drug-resistant TB due to incomplete or interrupted drug treatment regimens. An emphasis on 100% HIV testing compliance among persons with active TB disease will continue for well-documented reasons; it should be noted that HIV testing rates are outstanding over the last several years in Colorado and all recent efforts suggest that will continue. Colorado's TB Program will actively seek and advocate for close collaboration with community stakeholders throughout the state as well as other CDPHE disease prevention programs including the HIV/STI and Viral Hepatitis Programs.

Moving forward, the Colorado's TB Program will continue to utilize the latest diagnostic technologies including use of interferon-gamma release assays (IGRAs) to test for both TB infection and active TB disease among those populations CDC guidelines suggest will benefit most from this screening tool. Identifying opportunities to increase the use of 12 doses (once weekly for twelve weeks) of isoniazid and rifapentine (3HP) to treat TB infection will continue in efforts to both increase TB infection completion rates and reduce the adverse drug events documented using other treatment regimens. Related to this, Colorado's TB Data Coordinator was a co-author on an MMWR article (Oct. 4, 2013) highlighting results of a large contact investigation and the subsequent treatment of a large cohort of high school students using 3HP and other TB infection regimens. MMWR Article There will be a renewed emphasis on screening for, finding, and treating TB infection. This encourages the systematic addressing of the reservoir of TB infection by encouraging those infected to initiate and complete LTBI treatment; reducing the instances of progression to TB disease among those living with TB infection.